This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Previously Presented) A PET detector comprising:

a $LaBr_3$ or $LaCl_3$ scintillator comprising a plurality of $LaBr_3$ or $LaCl_3$ crystals, respectively, said scintillator having a decay time constant $\tau \leq 35$ ns and a light output at least equal to the light output of NaI(Tl); and

a plurality of photomultiplier tubes arranged with respect to said plurality of scintillator crystals wherein each photomultiplier tube receives light output from several of said scintillator crystals and wherein said scintillator crystals and said photomultiplier tubes are arranged respectively peripherally around a cavity for accepting a patient.

2. (Previously Presented) A PET scanner comprising:

a cavity for accepting a patient; and

a plurality of PET detector modules arranged about said cavity, each PET detector including a $LaBr_3$ or $LaCl_3$ scintillator comprising a plurality of $LaBr_3$ or $LaCl_3$ crystals, respectively, and said scintillator having a decay time constant $\tau \leq 35$ ns and a light output at least equal to the light output of NaI(Tl), and a plurality of photomultiplier tubes arranged with respect to said plurality of scintillator crystals wherein each photomultiplier tube receives light output from several of said scintillator crystals and wherein said scintillator crystals and said photomultiplier tubes are arranged respectively peripherally around said cavity.

3. (Previously Presented) A PET scanning system comprising:

a PET scanner comprising a cavity for accepting a patient and a plurality of PET detector modules arranged about said cavity, each PET detector including a $LaBr_3$ or $LaCl_3$ scintillator comprising a plurality of $LaBr_3$ or $LaCl_3$ crystals, respectively, and said scintillator having a decay time constant $\tau \leq 35$ ns and a light output at least equal to the light output of NaI(Tl), and a plurality of photomultiplier tubes arranged with respect to said plurality of scintillator crystals wherein each photomultiplier tube receives light output from several of said scintillator crystals and wherein said scintillator crystals and said photomultiplier tubes are arranged respectively peripherally around said cavity;

a time stamp circuit that records the time of receipt of gamma rays by respective PET detectors and provides timing data outputs; and

a processor that receives said timing data outputs, calculates time-of-flight (TOF) of gamma rays through a patient in the cavity, and uses said TOF of gamma rays in the reconstruction of images of the patient.

4. (Canceled)

5. (Canceled)

6. (Previously Presented) A PET detector as in claim 1, wherein said scintillator crystals are about 30 mm thick.

7. (Previously Presented) A PET detector as in claim 1, wherein said scintillator crystals have cross-sections of approximately 4 mm by 4mm.

8. (Previously Presented) A PET detector as in claim 1, wherein said scintillator crystals are connected to said photomultiplier tubes through a light guide using optical coupling.

9. (Previously Presented) A PET scanner as in claim 2, wherein said plurality of PET detector modules are arranged in an approximately cylindrical configuration about said cavity.